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## Heterogeneous Chemistry of Acetone and Methanol in Sulfuric Acid Solutions: Implications for the Upper Troposphere

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The uptake of acetone vapor by liquid sulfuric acid has been investigated over the range of 40-87 wt. % H<sub>2</sub>SO<sub>4</sub> and between the temperatures of 198 to 300 K. Studies were performed with a flow-tube reactor, using a quadrupole mass spectrometer for detection. At most concentrations studied (40 to 75 wt. %), acetone was physically absorbed by sulfuric acid without undergoing irreversible reaction. However, at acid concentrations at or above 80 wt. %, reactive uptake of acetone was observed, leading to products such as mesityl oxide and/or mesitylene. From time-dependent uptake data and liquid-phase diffusion coefficients calculated from molecular viscosity, the effective Henry's Law solubility constant (H\*) was determined. The solubility of acetone in liquid sulfuric acid was found to increase with increasing acid concentration and decreasing temperature. In the 75 wt. % and 230 K range, the value for H\* was found to be ~ 2x10<sup>(6)</sup> M/atm. This value suggests that acetone primarily remains in the gas phase rather than absorbing into sulfate aerosols under atmospheric conditions.

Under similar experimental conditions, the heterogeneous chemistry of methanol in sulfuric acid solutions has been investigated by the same technique. Preliminary results suggest that reactive uptake forming methyl sulfate takes place readily and it may have potential impact on hydroxyl radical production in the upper troposphere.

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